



Australian Government

Department of Industry
Tourism and Resources

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From:

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Submission to Joint Committee:

[Inquiry into the adequacy of funding for Australia's Antarctic Program](#)

Thank you for the opportunity to make comments on this important topic.

For many years I have managed the IPS Radio and Space Services routine ionospheric observing program in Antarctica. The observations from this program are used in a variety of research programs, both national and international. More important, these observations support space weather forecasting in the Australian region. Space weather can have a wide range of impacts on modern technological society, from the extreme (failure of power grids and destruction of satellite systems) to the subtle (possible faults in electronic chip fabrication). The more common impact of space weather is to complicate, and on occasions render inoperable, communications systems and a wide range of surveillance systems including over-the-horizon radar, especially those dependent on high frequency radio.

First, I would like to note that the present funding makes it possible to run a useful routine geophysical program in Antarctica. From my perspective, the advent of satellite communications, and especially an Internet link to Antarctica and Macquarie Island, was a major step forward. The ready access to observing platforms has allowed a range of automatic and remote operation impossible to contemplate previously. This has added value to our observations while significantly increasing the quality and quantity of the data collected.

Second, I would like to note that over the last three to four years we have experienced a reduction in available resources and access to the high latitude sites. This has come about partly from a restructuring of responsibilities in Antarctic Division, and partly from changes to the shipping schedules. These changes are not threatening our program, and while inconvenient in some respects, the changes have been carried out thoughtfully and with good consultation throughout. The main outcome has been a reduction in the ease of access to Antarctica because there are fewer voyages that match our requirements. We have assumed, and hope, that these changes are a prelude to introducing flights to Antarctica.

Third, I would like to pass comments on flights to Antarctica. We assume that for a successful flight program to be mounted further funds will be required. Whether this can be obtained from a reduction in the present shipping program is unclear but it seems unlikely. I am sure others will address the full extent that flights impact on the Australian Antarctic program. The current shipping approach, while well managed and taking full account of various demands, nevertheless has a rigid format. There are a limited number of voyages each season to each base and it is therefore

necessary to be cautious and conservative in the experiments fielded in a routine observation program. Better access, especially a longer time for summer visits at a base compared with the time available with the current ship voyages, will be more efficient and enable a greater variety of work to be carried out. I feel sure this amenity will be capitalised on by almost all experimenters with Antarctic interests, as well as attracting new investigators who were previously cautious about the logistics.

Finally, with the foregoing thoughts in mind, I would like to address the terms of reference for the Inquiry.

1. enhancing Australia's influence in the Antarctic Treaty system;

There is no doubt that a permanent program of flights to the Australian Antarctic bases will greatly enhance Australian influence in the Antarctic Treaty system. There will be an immediate impact when the flight program is initiated, because it will demonstrate a far larger commitment to Antarctic science than in the past. This should not be taken as a criticism of past commitment, but seen as a measure of the magnitude of the advance flights offer. This impact will be reinforced as all science programs capitalise on the greater access to Antarctica, and like the introduction of Internet, introduce new experiments and techniques. For example, in our case, better access will make it more efficient as we upgrade the equipment we operate.

2. protecting the Antarctic environment;

Increased human activity in Antarctica may affect the local electromagnetic environment. Some observation programs may be disturbed if the background radio noise level and magnetic contamination increase. The present levels should be maintained where feasible.

3. understanding Antarctica's role in the global climate system; and

Space weather forms part of the global geospace system, of which the lower atmospheric regions (troposphere, stratosphere, thermosphere) are a subset. The extent to which these regions are coupled is still a subject of research. Although, as a first approximation, the lower atmosphere is regarded as de-coupled from the thermosphere, there remains the dual interests of understanding the complex processes central to space weather, which are taking place above Antarctica, as well as exploring the possible linkages between the upper and lower atmosphere. Long, routine space weather observing programs form time series covering different states of the upper atmosphere that evolve and respond to complex inputs from the sun and magnetosphere. As understanding of these data sets increases, links to the lower atmosphere climate, if they exist, will become clearer.

4. conducting scientific research of practical, economic or national significance.

The IPS high latitude observation and research program offers practical support. For instance, ionospheric climatology, based on past ionospheric observations is the basis of current high frequency radio link planning. When supplemented by real-time observations, this forms a valuable basis for future advice that can support HF propagation. Furthermore, the effects of space weather can be particularly severe in Antarctica causing HF communications to be complicated and even rendered impossible due to polar cap absorption events. The current ionospheric sounding program, together with riometer observations provides alerts for these conditions. Flights to McMurdo Base have already been supported this way. Using real time ionospheric observations from Scott Base and Macquarie Island, together with observations from Hobart and Christchurch, IPS produces maps of the ionosphere between New Zealand and McMurdo Base. Similar support will be available for future flights to the Australian sector of Antarctica.

Yours sincerely,

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